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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/920,035	08/01/2001	Kai-Shu Yang	JCLA6567	5486

7590 03/29/2004

J.C. Patents, Inc.
Suite 250
4 Venture
Irvine, CA 92618

EXAMINER	
NGUYEN, KIMBINH T	
ART UNIT	**PAPER NUMBER**
2671	8

DATE MAILED: 03/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/920,035	YANG ET AL.	
	Examiner	Art Unit	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to amendment filed 9/3/03.

2. Claims 1-23 are pending in the application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Taubin et al. "Progressive Forest Split Compression", IBM T.J. Watson Research Center (ACM, published July 1998, pages 1-10) in view of Hoppe (6,046,744).

Claim 1, Taubin et al. discloses constructing a cluster from each vertex (vertex clustering algorithm) in a single resolution mesh constituted of vertices (vertex clustering, see section "Single-resolution mesh compression scheme", page 2; section "Clustered multi-resolution modes", page 7); constructing an expansion operation (forest split operation) by connecting the vertex with its adjacent vertices (see section 3.2 "the forest split operation", pages 3-4; figs. 1, 2 and 3), wherein the vertices comprises two or more than two vertices (n vertices; figs. 1, 2 and 3), Turban teaches in fig. 11, page 10 the numerical results (the relative cost of progressive vs. single resolution transmission of the connectivity and does not teach calculating a cost of expansion;

however, Hoppe teaches the lowest estimated energy cost of edge collapse operation (a cost of expansion, see col. 24, lines 49-53; fig. 19, #382); repeating the expansion (forest split operation) with the lowest cost for constructing a forest mesh; and Taubin teaches merging non-root vertices to t in a single operation step (each triangle t={i,j,k} of the simple polygon defines a new triangle of the refined mesh by replacing the polygon boundary loop indices i, j, k with there corresponding tree boundary loop indices; see section "Triangle tree boundary loops", page 5), wherein triangle t is a representative vertex of the cluster (see section "Clustered multi-resolution models", page 7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the lowest cost estimated energy cost for edge collapse transformation as taught by Hoppe into the progressive forest split compression of Taubin's method for constructing the progressive mesh representation, because it would minimize the energy metric to select successive modifications such as edge collapse transformation, to simplify the mesh to a base mesh (single resolution mesh) while best preserving the mesh's appearance (col. 24, lines 21-24). Taubin also teaches vertex as a root of the cluster (a rooted spanning tree in the graph of the mesh) after the connection until the first termination is fulfilled (fig. 2); performing a clustering simplification to each cluster in the forest repeating until the second termination condition is fulfilled to produce a simplified mesh (section 5, pages 7-8).

Claims 2-5, Taubin does not teach the calculating lowest cost; however, Hoppe discloses obtaining an expansion with the lowest cost (col. 24, lines 49-53), setting the expansion as disable (the method of edge collapse exits the loop) if the vertex has

combined with an expansion (v,u,x) has been carried out, wherein x is any vertex that differ from the vertex in the single resolution mesh (compares the number of faces in the mesh M resulting from the edge collapse is greater than the selected number of faces of the base mesh (single resolution mesh), see col. 25, lines 11-19), recalculating the cost of expansion without carrying the expansion if the cluster (vertices) is combined with other vertices after the expansion (edge collapse) is constructed (col. 25, lines 21-32). **Claims 12-23**, Hoppe discloses saving each round of simplification as a simplification record (figs 12, 14 and 15); converting the simplification record into a refinement sequence (col. 31, lines 39-48); the first termination (edge collapse) and the second termination (vertex split) are deduced from a condition between levels in an user-defined resolution mesh (the software application selects the coarser and finer meshes of level-of-detail by the computer user (col. 14, lines 53-60; col. 24, lines 54-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the lowest cost estimated energy cost for edge collapse transformation as taught by Hoppe into the progressive forest split compression of Taubin's method for constructing the progressive mesh representation, because it would minimize the energy metric to select successive modifications such as edge collapse transformation, to simplify the mesh to a base mesh (single resolution mesh) while best preserving the mesh's appearance (col. 24, lines 21-24).

Claims 6-11, Taubin et al. discloses the vertex t is combined with each vertex outside the vertex t when the clustering simplification is performed (each connected component is a simple polygon (triangulated with no internal vertices), see section "The

forest collapse operation", the right column of page 7); eliminating the triangles using two or more vertices in the cluster (all vertices in each cluster are collapsed into a single vertex of the next level of detail, clustering algorithms are based on triangle collapsing and edge collapsing, see section "Clustered multi-resolution models", the right side column of page 7); moving the corner of the triangle (jumping from triangle corner to neighboring triangle corner) which uses a non-representative vertex in the cluster to where the representative vertex is located (see the left column (the top paragraph) of page 5).

Response to Arguments

5. Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground(s) of rejection.

With respect to applicant's argument, claim 1 has been modified and rejected under 35 U.S.C. 103(a) as being unpatentable over Taubin et al. "Progressive Forest Split Compression", IBM T.J. Watson Research Center (ACM, published July 1998, pages 1-10) in view of Hoppe (6,046,744), because Taubin teaches single resolution mesh using progressive forest split operation (expansion operation) for growing a forest (doubling the number of n of triangles (vertices)) and then performing a clustering simplification (all the vertices in each cluster are collapsed into a single vertex; see section 5, pages 7-8). Hoppe teaches calculating an estimated energy cost of vertex split operation and edge collapse transformation.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Kimbinh Nguyen** whose telephone number is **(703) 305-9683**. The examiner can normally be reached **(Monday- Thursday from 7:00 AM to 4:30 PM and alternate Fridays from 7:00 AM to 3:30 PM)**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Part II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

March 24, 20004

/Kimbinh Nguyen/

Kimbinh Nguyen

Patent Examiner AU 2671